EXERCISE (A)
MULTIPLE CHOICE TYPE:

Question 1:
Transpiration pull will be maximum under which set of the following conditions?
(a) Open stomach, dry atmosphere and moist soil.
(b) Open stomata, high humid atmosphere and well irrigated soil.
(c) Open stomata, high humid atmosphere and dry soil.
(d) closed stomata, dry atmosphere and dry soil.
Solution 1:
(a) Open stomata, dry atmosphere and moist soil

Question 2:
With decrease in atmospheric pressure, the rate of transpiration will
(a) increase
(b) decrease rapidly
(c) decrease slowly
(d) remain the same
Solution 2:
(a) increase

Question 3:
The rate of transpiration is more when
(a) atmosphere is dry
(b) temperature is high
(c) humidity is high
(d) atmosphere is dry and temperature is high
Solution 3:
(b) temperature is high

Question 4:
One of the internal factors which affect the rate of transpiration is
(a) big size of the leaf
(b) colour of the leaf
(c) sunken stomata
(d) sunny day
Solution 4:
(c) sunken stomata

Question 5:
Guttation takes place through
(a) stomata
(b) lenticels
(c) lower epidermis of leaves
(d) hydathodes
Solution 5:
(d) hydathodes

Question 6:
The loss of water as water vapour from the acrial parts of a plant is known as
(a) evaporation
(b) perspiration
(c) guttation
(d) transpiration
Solution 6:
(d) transpiration

Question 7:
Transpiration will be fastest when the day is
(a) cool, humid and windy
(b) hot, humid and still
(c) hot, humid and windy
(d) hot, dry and windy
Solution 7:
(d) hot, dry and windy

Question 8:
Most of the transpiration in tall trees occurs through
(a) stomata
(b) Lenticels
(c) cuticle
(d) Bark
Solution 8:
(b) Lenticels

Question 9:
Transpiration is best defined as
(a) loss of water by the plant
(b) evaporation of water from the surfaces of a plant
(c) loss of water, as water vapour, by a plant
(d) release of water by a plant into the atmosphere
Solution 9:
(b) evaporation of water from the surfaces of a plant

B. VERY SHORT ANSWER TYPE:

Question 1:
Name the following:
(a) openings on the stem through which transpiration occurs
(b) The process by which the intact plant loses water in the form of droplets.
(c) An instrument used to find the rate of transpiration
(d) A plant in which the stomata are sunken
(e) The apparatus to record the rate of transpiration in a cut shoot.
(f) Any two parts of a leaf which allows transpiration.
(g) The structure in a leaf that allows guttation.
(h) Loss of water as droplets from the margins of certain leaves.
Solution 1:
(a) Lenticels
(b) Guttation
(c) Potometer
(d) Nerium
(e) Ganong's photometer
(f) Stomata and cuticle
(g) Hydathodes
(h) Guttation

Question 2:
Fill in the blanks:
(a) Transpiration is the loss of water as water …… from the …… parts of the plant.
(b) Closing of …… and shedding of leaves reduce ……..
(c) Transpiration helps in creating ……. Force and in eliminating excess…….
Solution 2:
(a) vapour, aerial
(b) stomata, transpiration
(c) suction, water (heat)

C. SHORT ANSWER TYPE:

Question 1:
Given below is an example of a certain structure and its special functional activity:

Chloroplasts and Photosynthesis.

In a similar way, write the functional activity against each of the following:
(a) Hydathodes and …….
(b) Leaf spines and ……
(c) Lenticels and ……
(d) Thick cuticle and ……..

Solution 1:
(a) guttation
(b) protection and reduced transpiration
(c) transpiration
(d) reduced transpiration

Question 2:
(a) State whether the following statements are True (T) Or False (F)?
(i) Most transpiration occurs at midnight.
(ii) Transpiration creates a pull for upward movement of the sap.
(iii) Wind velocity has an effect on transpiration.
(iv) Voltmeter is an instrument used for measuring the rate of transpiration in green plants.

(b) Rewrite the false statements, in (a) above, in the correct form by changing either the first or the last word only.

Solution 2:
(a)
(i) False
(ii) True
(iii) True
(iv) False
(b)
(i) Most transpiration occurs at mid-day.
(iv) Potometer is an instrument used for measuring the rate of transpiration in green plants.

Question 3:
Give suitable explanation for the following:
a) A higher rate of transpiration is recorded on a windy day rather than on a calm day.
b) Excessive transpiration results in the wilting of the leaves.
c) Water transpired is the water absorbed.
d) More transpiration occurs from the lower surface of a dorsiventral leaf.
e) Cork and bark of trees help in preventing loss of water.
f) Perspiration and transpiration help to cool the body temperature of the organism.
g) On a bright sunny day, the leaves of certain plants roll up.

Solution 3:

a) Transpiration increases with the velocity of wind. If the wind blows faster, the water vapours released during transpiration are removed faster and the area surrounding the transpiring leaf does not get saturated with water vapour.

b) When the rate of transpiration far exceeds the rate of absorption of water by roots, the cells lose their turgidity. Hence, excessive transpiration results in wilting of the leaves.

c) Plants absorb water continuously through their roots, which is then conducted upwards to all the aerial parts of the plant, including the leaves. Only a small quantity of this water i.e. about 0.02% is used for the photosynthesis and other activities. The rest of the water is transpired as water vapour. Hence water transpired is the water absorbed.

d) There are more stomatal openings on the lower surface of a dorsiventral leaf. More the number of stomata, higher is the rate of transpiration. Hence more transpiration occurs from the lower surface.

e) Cork and Bark of trees are tissues of old woody stems. Bark is thick with outermost layer made of dead cells and the cork is hydrophobic in nature. These properties make them water-proof and hence they prevent transpiration.

f) In both perspiration and transpiration, water is lost by evaporation from the body of the organism as water vapour. This evaporation reduces the temperature of the body surface and brings about cooling in the body of the organism.

g) On a bright sunny day, the rate of transpiration is much higher than any other days. The leaves of certain plants roll up on a bright sunny day to reduce the exposed surface and thus reduce the rate of transpiration.

Question 4:

Which of the following statements are true and which ones are false? Give reason in support of your answer.

(a) Potometer is an instrument used for Demonstration of transpiration occurring from the lower surface of a leaf.
(b) Forest contribute in bringing rains.
(c) Hydathodes are similar to stomata in plant physiology.
(d) Atmospheric humidity promotes transpiration from a green plant.
(e) Some desert plants have sunked stomata on their leaves.
(f) Most transpiration occurs during midday.

Solution 4:

(a) False

Reason: Potometer is used to measure the rate of transpiration in a plant. Demonstration of transpiration occurring from the lower surface of a leaf is done by analyzing the changes in colour of pieces of dry cobalt chloride paper attached (and held in place) to the two surfaces of a leaf.

(b) True
Reason: Transpiration carried out by the large number of trees in a forest. This increases the moisture in the atmosphere and brings rain.
(c) False
Reason: Hydathodes are special pores present on the ends of leaf veins through which guttation occurs and water droplets are given out. Their openings cannot be regulated. Stomata on the other hand are minute openings in the epidermal layer of leaves through which exchange of gases as well as transpiration occurs. Water is given out as water vapour. Stomatal opening is regulated by guard cells.
(d) False
Reason: Transpiration is reduced during high atmospheric humidity. High humidity in the air reduces the rate of outward diffusion of the internal water vapour across stomata, thereby reducing the rate of transpiration.
(e) True
Reason: Desert plants need to reduce transpiration as much as possible so as to survive in the hot and dry environment. Hence some of them have sunken stomata as an adaptation to curtail transpiration.
True
Reason: During the day, the stomata are open to facilitate the inward diffusion of carbon dioxide for photosynthesis. During mid-day, the outside temperature is higher, due to which there is more evaporation of water from the leaves. Therefore more transpiration occurs during mid-day.

Question 5:
Differentiate between guttation and bleeding in plants.
Solution 5:

Guttation	Bleeding
It is the removal of excess of water from the plants because of excess water buildup in the plant.	It is the removal of water from the plant because of injury.
Water escapes from specialised structures called hydathodes.	Water escapes in the form of sap from the injured part of the plant.

D. LONG ANSWER TYPE:

Question 1:
What is wilting? Some plants show wilting of their leaves at noon even when the soil is well watered, Why is it so?
Solution 1:
Wilting refers to the loss of cellular turgidity in plants which results in the drooping of leaves or plant as a whole because of lack of water.

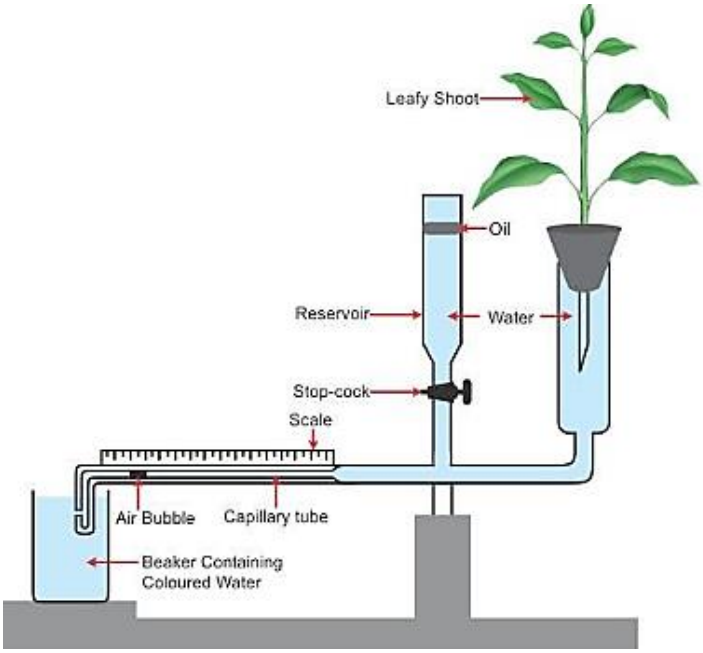
During noon the rate of transpiration exceeds the rate of absorption of water by roots. Due to the excessive transpiration, the cells of leaves lose their turgidity and wilt.

Question 2:
Why are the stomata in most plants more numerous on the lower surface of a leaf instead of being on the upper surface?
Solution 2:
The lower surface of leaf is sheltered from direct sunlight. If more stomata are on the upper surface of a leaf, then excessive transpiration would occur, resulting in quick wilting of the plant. Hence most plants have more numerous stomata on the lower surface of a leaf to control the rate of transpiration.

Question 3:
Suppose you have a small rose plant growing in a pot. How would you demonstrate transpiration in it?
Solution 3:
Take the small potted rose plant and cover it with a transparent polythene bag. Tie its mouth around the base of the stem. Leave the plant in sunlight for an hour or two.

Drops of water will soon appear on the inner side of the bag due to the saturation of water vapour given out by the leaves. A similar empty polythene bag with its mouth tied and kept in sunlight will show no drops of water. This is the control to show that plants transpire water in the form of water. If tested with dry cobalt chloride paper, the drops will be confirmed as water only.

Question 4:
What is a photometer?
Solution 4:



Potometer is a device that measures the rate of water intake by a plant. This water intake is almost equal to the water lost through transpiration. Potometers do not measure the water lost due to transpiration but measure the water uptake by the shoot.

Question 5:
What is lenticular transpiration? Mention one major difference between lenticular transpiration and stomatal transpiration.
Solution 5:
Transpiration occurring through lenticels i.e. minute openings on the surface of old stems is called lenticular transpiration.

Stomatal transpiration is controlled by the plant by altering the size of the stoma, where as this does not happen in case of lenticular transpiration. This is because the lenticels never close, but remain open all the time.
The amount of stomatal transpiration is much more than the amount of lenticular transpiration.

Question 6:
List any three major factors that accelerate the rate of transpiration.
Solution 6:
The factors that accelerate the rate of transpiration are:
(i) High intensity of sunlight
(ii) High temperature
(iii) Higher wind velocity

(iv) Decrease in atmospheric pressure
(Any three)

Question 7:
There is a general belief that forests tend to bring more frequent rains. Can you explain it scientifically?
Solution 7:
Forests have large number of plants especially trees. Each plant loses water in the form of water vapour everyday into the atmosphere through transpiration. A large apple tree loses as much as 30 litres of water per day. So huge amount of water is escaped into the atmosphere by forests. This increases the moisture in the atmosphere and brings more frequent rains.

Question 8:
List the four advantages of transpiration to the plants.
Solution 8:
The advantages of transpiration to the plants are:
(i) Transpiration brings about a cooling effect to the plant body since evaporation of water reduces the temperature of leaf surface.

(ii) Transpiration helps in the ascent of sap by producing a suction force acting from the top of the plant.

(iii) Transpiration helps in distributing water and mineral salts throughout the plant body.

(iv) Transpiration helps in eliminating excess water.

Question 9:
Mention any three methods by which the plants tend to reduce transpiration.
Solution 9:
(i) If the water content of the leaves decreases due any reason, the guard cells turn flaccid, thereby closing the stomatal opening and transpiration stops.

(ii) Some plants have sunken stomata whereas others have reduced number of stomata to reduce transpiration.

(iii) In some plants, leaves may be dropped or may be absent or changed into spines as an adaptation to reduce transpiration.

(iv) The leaves may be covered by thick cuticle such as in Banyan tree, so as to reduce transpiration.

Question 10:
Droplets of water may sometimes be seen along the margins of the leaves of a banana plant, growing in wet soil, in the mornings. Are these dew drops? Comment upon your answer.
Solution 10:
No, they are not dew drops.

This is water given out by the plant body through guttation. Since the banana plant is growing in humid environment, transpiration is hampered. But the roots continue to absorb water from the soil. This builds up a huge hydrostatic pressure within the plant and forces out the excess water from the hydathodes, which are pores present at the tips of veins in the leaf. This is observed especially during the mornings.

Question 11:
Briefly explain how the rate of transpiration is affected by
(a) Intensity of light
(b) Humidity of the atmosphere
Solution 11:
(a) Intensity of light - During the day, the stomata are open to facilitate the inward diffusion of carbon dioxide for photosynthesis. At night they are closed. Hence more transpiration occurs during the day. During cloudy days, the stomata are partially closed and the transpiration is reduced.

E. STRUCTURED / APPLICATION / SKILL TYPE:

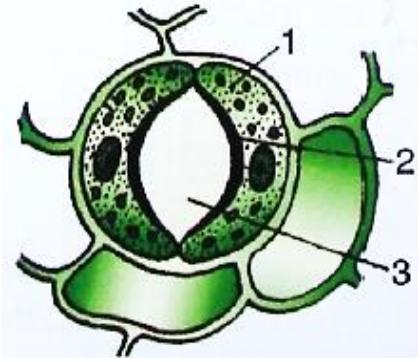
Question 1:
In an experiment, four freshly plucked leaves (A-D) of a plant, such as those of china – rose, were treated as follows:
(a) Coated with Vaseline on its upper surface.
(b) coated on the lower surface.
(c) coated on both surface
(d) left uncoated.

All the four leaves A, B, C & D were left in a room for about 24 hours.
(i) which leaf would become most limp? Why?
(ii) which leaf would show least limping? Why?
Solution 1:
(i) The leaf D would become most limp. This is because water would be lost through transpiration from upper as well as the lower surface of leaf D since it is uncoated.

(ii) The least limping would be shown by leaf C since its upper and lower surfaces have been coated with vaseline. So no water is lost from the leaf through transpiration since the stomatal openings get blocked by vaseline.

Question 2:

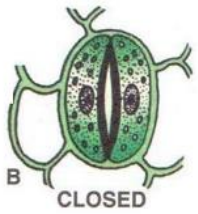
Given below is a diagrammatic sketch (surface view) of a stomatal apparatus from a dicot leaf.



(a) Label the parts numbers 1-3
(b) Is this state, open or closed?
(c) Is this stoma, of a dicot leaf or a monocot leaf?
(d) Redraw a sketch of the stomatal apparatus in the state opposite to the one shown here.

Solution 2:

(a)
1- Guard Cell
2- Inner wall of the Guard Cell
3- Stoma/Stomatal Aperture
(b) Open state
(c) The structure of stoma remains same in monocots as well as in dicots. Hence, the stoma from the diagram can be of a monocot leaf or of a dicot leaf.
(d)



B – Guard cells flaccid, the stoma closes.

Question 3:

Given alongside is the diagram of an experimental set-up to demonstrate a certain phenomenon in plants.
(a) Name the phenomenon being demonstrated.
(b) what is the purpose of putting oil the test tube?
(c) Would it make a difference if the experimental set – up is kept in bright sunshine?
(d) what is the purpose of the spring balance in the set-up?

Solution 3:

(a) Transpiration

(b) Oil is put on the surface of water to prevent loss of water by evaporation.

(c) Yes, the transpiration rate will increase. Transpiration would occur faster. The observable changes will occur in less time.

(d) The spring balance progressively measures the change in weight of the set-up. This because as the plant transpires, it creates the suction force in plant which allows roots to absorb more water from the test tube. Hence, the water in the test will get reduced. Thus, the weight of the entire set will decrease.